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Phytogeographical notes on the Rocky Mountain region

VI. Distribution of the subalpine plants

P. A. Rydberg

I have already pointed out in a paper entitled "Vegetative Life Zones of the Rocky Mountains," read at the twentieth anniversary of the New York Botanical Garden, that the Subalpine and Montane Zones of the Rockies are very different from those zones in the eastern part of North America, although the Hudsonian and Canadian Zones extend west to the foot of the Rockies from the headwaters of the Athabasca River northward. Also, I showed that the aspen was the only one among the ecologically important trees, common to the eastern and central (Rocky Mountain) provinces, that the Subalpine and Montane Zones of the central and western (Pacific) provinces merge in the north, and that many species have emigrated from either of these provinces to the other. These statements were largely based on the most conspicuous element of these zones, namely, the forest trees. Now it is to be shown whether or not these statements apply to the secondary species of the forests, to the grasslands and other herbaceous formations, and to the coppice.

The subalpine flora may be divided into the following categories:—I. The transcontinental element, many members of which are also found in the Old World; II. Plants common to the Rockies and either of the other provinces; III. The endemic element. To the first belong the larger proportion of the plants common to the alpine-arctic zone.

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Some of the plants of the first category may have a range limited in the Middle Province to the Canadian Rockies alone; others may extend throughout the Northern Rockies, but not be found in the Southern; while still others may extend throughout the Rocky Mountain system. Of the second category, some plants may be common to the Rockies and the Hudsonian Zone of the east, some others common to the Rockies and the Pacific mountains, or to the Sierra Madre in Mexico, or to the Alaskan mountains, or to the arctic coast. Some might have their home in the Rockies and spread to other regions, and others might be immigrants into the Rocky Mountain system. Among the plants of the third category, many are distributed throughout the Rockies, others have a distribution limited to either the Northern or the Southern Rockies, or to certain parts of either, while still others are purely local.

The strictly subalpine element of the flora of the Rockies is in fact very small, the plants consisting mostly of species that are found also in the Montane Zone, especially the upper part thereof, and of alpine-arctic species, running down in the swales, along the streams, or along the wind-swept hog-backs. In fact some plants, especially aquatics and hydrophytes, are common to three or more zones. In the following lists the plants common to the alpine-arctic zone are designated by a dagger (†). No attempt is made to designate those common to the Montane Zone, as they would probably constitute 90 per cent. of the remaining species.

I

1. TRANSCONTINENTAL SPECIES RANGING THROUGHOUT THE ROCKIES

This element is represented among the trees by the quaking aspen, *Populus tremuloides*,* but this tree is not one of the characteristic trees of the Subalpine or Subarctic Zone either of the east or of the Rockies, nor is it limited to the subalpine regions. One should therefore not lay too much stress upon this tree and its distribution when considering the resemblances of and distinctions between the Hudsonian flora and the subalpine flora of the Rockies. Looking over the following two lists we find that they are mostly made up of either aquatic plants and hydrophytes or plants from dense or open woods or copses, requiring a good deal of moisture.

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* It is true that some botanists, such as Tidestrom, Wooton and Standley, regard the Rocky Mountain aspen as a distinct species, *Populus aurea*, differing in smaller, thicker, less toothed leaves and different colored anthers and bark, but as the distribution of this species has not been worked out, it is better here to ignore the same and include it in *P. tremuloides*.

Trees

Populus tremuloides

Shrubs

Salix chlorophylla
Betula glandulosa
Lepargyrea canadensis
Vaccinium caespitosum
Linnaea americana
Distegia involucrata

Herbs

Sparganium minimum
" *angustifolium*
Potamogeton natans
" *alpinus*
" *heterophyllus*
" *Richardsonii*
" *pectinatus*
" *filiformis*
Triglochin palustris
" *maritima*
Scheuchzeria palustris
Savastana odorata
Muhlenbergia racemosa
Phleum pratense
" *alpinum*
Alopecurus aristulatus
" *occidentalis*
Agrostis hiemalis
" *canina*
Calamagrostis Langsdorfii
" *canadensis*
" *purpurascens*
Deschampsia caespitosa
" *atropurpurea*
Avena striata
Danthonia intermedia
Trisetum subspicatum
Phragmites Phragmites
†*Catabrosa aquatica*
Bromus ciliatus
Poa pratensis
† " *alpina*
" *crocata*
†*Festuca curtifolia*
Panicularia nervata
Hordeum jubatum
Agropyron violaceum
Eriophorum angustifolium
†*Carex Hepburnii*
" *leptalea*
† " *obtusata*
† " *gynocrates*
" *siccata*
" *interior*
" *canescens*
" *brunnescens*
" *Rossii*
" *aurea*

†*Carex capillaris*
“ *misandra*
“ *Halleri*
† “ *atrata*
“ *rostrata*
Lemna minor
†*Juncus triglumis*
† “ *castaneus*
Juncoides parviflorum
† “ *spicatum*
“ *intermedium*
†*Lloydia serotina*
Vagnera stellata
Lysiella obtusata
Peramium ophioides
†*Cytherea bulbosa*
†*Oxyria digyna*
†*Bistorta vivipara*
Alsine longifolia
“ *laeta*
“ *crassifolia*
“ *borealis*
Moehringia macrophylla
“ *lateriflora*
Sagina saginoides
†*Silene acaulis*
Anemone parviflora
Pulsatilla ludoviciana
†*Thalictrum alpinum*
Batrachium confervoides
†*Draba crassifolia*
† “ *fladnizensis*
† “ *aurea*
†*Chrysosplenium tetrandrum*
†*Saxifraga cernua*
Leptasea Hirculus
†*Sibbaldia procumbens*
†*Potentilla quinquefolia*
† “ *nivea*
† “ *uniflora*
Dasiphora fruticosa
Geum rivale
Tium alpinum
Epilobium alpinum
“ *Hornemannii*
† “ *anagallidifolium*
Chamaenerion angustifolium
† “ *latifolium*
Hippurus vulgaris
Moneses uniflora
Pyrola uliginosa
“ *chlorantha*
“ *minor*
“ *secunda*
Menyanthes trifoliata
Veronica americana
“ *Wormskioldii*
“ *serpyllifolia*
†*Elephantella groenlandica*
Utricularia vulgaris
“ *minor*
Campanula petiolata
Erigeron jucundus
“ *compositus*
Artemisia spithamaea

2. TRANSCONTINENTAL SPECIES CONFINED TO THE NORTHERN ROCKIES

The number of transcontinental plants found in the Northern Rockies, but not in the Southern, is much smaller, and of these a larger percentage are arctic-alpine, descending into the Subalpine Zone. Among these plants there are no trees and only a few low shrubs.

Shrubs

†*Salix pseudomyrsinites*
Ribes hudsonianum
Andromeda polifolia
Chiogenes hispidula
Vaccinium uliginosum

Herbs

†*Eriophorum Chamissonis*
†*Scirpus pauciflorus*
† “ *caespitosus*
†*Carex capitata*
“ *aenea*
“ *Heleonastes*
† “ *supina*
“ *deflexa*
“ *Hassei*
“ *livida*
“ *vaginata*
“ *atratiformis*
“ *miliaris*
“ *scirpoidea*
†*Juncoides hyperboreum*
Cypripedium passerinum
†*Ranunculus hyperboreus*
Drosera rotundifolia
Parnassia palustris
† “ *Kotzebuei*
†*Saxifraga rivularis*
Anthiphylla oppositifolia
Comarum palustre
Mertensia paniculata
Veronica scutellata
†*Pinguicula vulgaris*
Valeriana septentrionalis
Erigeron alpinus
“ *unalaschkensis*
“ *purpureum*
Senecio pauciflorus

3. TRANSCONTINENTAL SPECIES LIMITED TO THE CANADIAN ROCKIES

Some of the transcontinental subarctic plants have not spread at all south in the mountains and are found in the Rockies only at an altitude where the Subarctic Zone covers the lowlands. In other words, they are found only in the Canadian Rockies. These plants are also found north of the arctic timberline. They are:

Shrubs

†*Rubus acaulis*
† “ *Chamaemorus*
†*Ledum groenlandicum*
†*Cassiope tetragona*
†*Vaccinum Vitis-Idaea*
†*Oxycoccus Oxycoccus*

Herbs

†*Eriophorum Scheucheri*
† " *alpinum*
†*Juncoides arcticum*
† " *arcuatum*
†*Orchis rotundifolia*
†*Arenaria norvegica*
†*Drosera longifolia*
†*Condrosea Aizoon*
†*Leptasea tricuspidata*

II

1. Species nearly equally distributed in the Rockies and the Pacific mountains

There are many species which seem equally at home both in the Rocky Mountains, the Sierra Nevada and the Cascade Mountains. The larger part of these are more or less xerophytic plants growing in the drier part of the subarctic zone, especially on southern exposures. Nearly all of the plants listed below are also equally distributed in the Montane and the Subalpine Zones. To these belong four of the conifers, *Pseudotsuga mucronata*, *Pinus Murrayana*, *P. flexilis* and *P. albicaulis*. Of these the last mentioned is the only one which is not better represented in the Montane Zone. Its distribution is also more extensive in the Pacific mountains, and it is not found in the Southern Rockies. It has therefore been placed among the immigrants, though its original home might be the Northern Rockies. *Pseudotsuga mucronata* is also found in the mountains of northern Mexico. All extend north in the Rockies to about latitude 55 degrees, except *Pinus Murrayana*, which grows much further north in the Yukon Valley, at latitude 65 degrees.

Trees

Pseudotsuga mucronata
Pinus Murrayana
Pinus flexilis

Shrubs

Salix glaucops
Ribes montigenum
Pachystima myrsinites
Phyllodoce empetriformis
Ledum glandulosum
Kalmia microphylla
Gaultheria humifusa

Herbs

Muhlenbergia comata
Agrostis asperifolia
“ *variabilis*
Danthonia californica
Graphephorum muticum
Poa longiligula
“ *Fendleriana*
Bromus polyanthus
Panicularia pauciflora
Elymus glaucus
†*Carex nigricans*
“ *Douglasii*
“ *illota*
“ *athrostachya*
“ *phaeocephala*
“ *festivella*
“ *Reynoldsii*
“ *nova*
Lemna gibba
Veratrum speciosum
†*Juncus Drummondii*
† “ *Parryi*
“ *Mertensianus*
Eriogonum umbellatum
†*Bistorta bistortoides*
Alsine bailcalensis
“ *calycantha*
†*Cerastium beeringianum*
Alsinopsis Nuttallii
Nymphaea polysepala
Anemone globosa
Ranunculus Eschscholtzii
Aconitum columbianum
Cardamine umbellata
*Draba nitida**
† “ *oligosperma*
†*Rhodiola integrifolia*
Parnassia fimbriata
Pectianthia pentandra
Micranthes arguta
Ivesia Gordonii
Potentilla diversifolia
Fragaria bracteata
Gayophytum racemosum
Amarella strictiflora
“ *plebeia*
Leptodactylon Nuttallii
Phacelia heterophylla
Pentstemon procerus
Mimulus Langsdorfii
Pedicularis racemosa
“ *bracteata*
Erigeron simplex
“ *Coulteri*
“ *salsuginosus*
†*Antennaria media*
“ *rosea*
Dugaldia Hoopesii‡
Achillea lanulosa
Arnica pedunculata
“ *cordifolia*

2. SPECIES COMMON TO THE ROCKIES AND THE MOUNTAINS OF THE GREAT BASIN

A few plants are distributed through a larger or smaller part of the Southern Rockies (especially the Wasatch Mountains of Utah and the Bear River Mountains of Idaho) and of the higher mountains of the Great Basin extending to the eastern slopes of the Sierra Nevada. These plants are very few in the Subalpine Zone, more in the Montane, and still more in the Submontane and Upper Sonoran. Some of these are listed under the endemic element of the Rockies, as it is very hard to tell whether their original homes are in the Rockies or in the Basin mountains. To this element belongs one tree, *Pinus aristata*, growing on dry southern slopes from Colorado west to eastern California. It is perhaps more frequently met with in Colorado, but it might have originated on the eastern slopes of the Sierra Nevada, as its only close relative, *P. Balfouriana*, is also found there. The following is a partial list of the plants of this category:

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* Lacking in Colorado.

‡ In the Southern Rockies only.

Tree

Pinus aristata

Herbs

†*Erigeron Kingii*
†*Draba pectinata*
Ivesia utahensis
Drymocallis pumila
Kentrophyta tegetaria
Macronema discoidea
Senecio seridophyllus

3. Species common to the Northern Rockies and the Cascade Mountains

As the Northern Rockies and the Cascades are connected by several mountain chains in British Columbia, it is very hard to decide where these common plants should be counted, to the Rocky Mountain flora or to the flora of the Cascades. It is probable that to the former should be counted those which are generally distributed in the main chain of the Rockies in Alberta and Montana, especially if their range extends south into the Yellowstone Park. I would even include in the Rocky Mountain flora such species as *Larix Lyallii* (although very local), which crosses the main range at a few places, while I would count *Tsuga Mertensiana*, which extends east only to the Bitter Root and Selkirk Mountains, to the Cascade element.

a. Rocky Mountain Element

Tree

Larix Lyallii

Shrubs

Ribes petiolaris
†*Phyllodoce glanduliflora*

Herbs

Carex Tolmiei
Tofieldia intermedia
Erythronium grandiflorum
Eriogonum Piperi
“ *polyphyllum*
†*Draba lonchocarpa*
Ozomelis trifida
Heuchera ovalifolia
Drymocallis pseudorupestris
Atragallus spicatus
Hedysarum sulphurescens
Amarella anisopetala
Pentstemon crassifolium
Castilleja lutea
“ *pallescens*
Erigeron pedatus
Antennaria corymbosa
†*Senecio Fremontii*

b. Cascade Element

Tree

Tsuga Mertensiana

Shrubs

Salix Barclayi
“ *subcaerulea*
Alnus sinuata
Rubus nivalis
Azaliastrum albiflorum
Gaultheria ovatifolia

Herbs

Carex laeviculmis
“ *stenochlaena*
“ *Mertensii*
Juncoides glabratum
Alnus sinuata
Silene oregana
†*Ranunculus Suksdorfii*
Aquilegia columbiana
†*Smelowskia ovalis*
Arabis Lyallii
Hemieva ranunculifolia
†*Lutkea pectinata*
Viola adunca
Osmorrhiza Leibergii
Pentstemon fruticosus
Synthyris reniformis

Most of these extend to the western slopes of the Rockies in British Columbia or northern Montana, but *Tsuga Mertensiana, Osmorrhiza Leibergii* and *Synthyris reniformis* are restricted to the western slopes of the Bitter Root Mountains in Idaho.

4. Western immigrants from the Sierra Nevada and the Cascades, which have invaded the Northern Rockies

There are a number of species which are common to the Pacific mountains and the Rockies, but have a wider distribution in the former than in the latter. Their home may therefore be regarded as being on the west coast, and they may be regarded as immigrants into the Rocky Mountains. Those of the following list are common to the Sierra Nevada and the Cascades, and their range extends into the Northern Rockies. Some of these are found in the Bitter Root or the Selkirk Mountains only, and are without doubt immigrants. Others extend into the main Rockies of Alberta and Montana and even as far south as northern Wyoming. Whether these are immigrants or endemics to the Rockies is more doubtful. A very few reach the Wasatch Mountains in northern Utah. There are no immigrants from the Sierras to the southern Rockies. It is true that there are a few subalpine endemics common to the Sierra Nevada and the Southern Rockies, but these are plants characteristic of the mountains of the Great Basin, and limited to the eastern slope of the Sierra Nevada and the western slope of the Rockies.

Trees

Pinus albicaulis
Salix sitchensis

Shrubs

†*Salix cascadensis*
Ribes laxiflorum
Ribes glandulosum
Cassiope Mertensiana
Vaccinium occidentale
Linnaea longiflora

Herbs

Stipa oregonensis
Poa Cusickii
Carex spectabilis
Xerophyllum tenax

Juncus Regelii
" *nevadensis*
Cytherea occidentalis
†*Eriogonum pyrolaefolium*
Naiocrene parvifolia
†*Arenaria salmonensis*
Anemone Drummondii
Pulsatilla occidentalis
Ranunculus alismellus
Aquilegia formosa
Thlaspi californicum
Dentaria rupicola
Draba eurocarpa
Pectianthia Breweri
Heuchera glabra
Potentilla flabellifolia
Epilobium oregonense
" *luteum*
†*Dasystephana calycosa*
Romanzoffia sitchensis
Adenostegia ramosa
†*Pedicularis contorta*

Of these *Eriogonum pyrolaefolium*, *Draba eurocarpa*, *Potentilla flabellifolia* and *Linnaea longiflora* are limited to the Bitter Root-Selkirk region, while *Pinus albicaulis* and *Stipa oregonensis* extend south to Wyoming, and *Vaccinium occidentale* to northern Utah.

5. IMMIGRANTS FROM ALASKA AND THE ARCTIC COAST

The following are mostly arctic, a few being subarctic plants from near the arctic timber line, which extend farther south in the Rockies and are there found in the subalpine as well as the alpine zone. Of these *Silene repens*, *Micranthes Lyallii*, *Dasystephana glauca* and *Euphrasia mollis* extend as far south as Montana; the others are limited to the Canadian Rockies.

Shrubs

†*Salix myrtillifolia*
† " *alaxensis*
† " *Barrattiana*
† " *Seemanii*
" *Drummondiana*
Salix arbusculoides
" *desertorum*
" *saskatchewana*
†*Arctous erythrocarpa*

Herbs

Carex venustula
" *physocarpa*
" *MacCallae*
Silene repens
†*Anemone Richardsonii*
Aconitum delphinifolium
Sophia sophioides
Pilosella Richardsoniana
Arabis ambigua
Micranthes Lyallii

Micranthes aestivalis
Spathularia Brunnoniana
" *ferruginea*
Argentina subarctica
†*Hedysarum Mackenzii*
Moneses reticulata
Androsace septentrionalis[*]
†*Amarella propinqua*
†*Dasystephana glauca*
†*Castilleja pallida*
Euphrasia mollis
Valeriana sitchensis
†*Campanula heterodoxa*
Erigeron grandiflorum
Erigeron lanatus
†*Antennaria monocephala*
†*Artemisia Richardsoniana*
Petasites frigida
" *corymbosa*
Senecio lugens

6. Immigrants from the south

Immigrants from the south are almost unknown in the Subalpine Zone; they are more frequent in the Montane and Submontane Zone and are very common in the Sonoran. The following are the only ones found in the subalpine zone:

Pseudocymopterus purpureus
Blepharineuron tricholepis

III

1. Endemic species, which also have emigrated into the Cascade Mountains

The endemic element of the Rocky Mountains is by far the largest. As the Rockies and the Cascades are connected through several mountain chains it is natural that many of the endemic Rocky Mountain species should have emigrated into the Cascade Mountains. Let us treat these species first.

The dominant tree in the Subalpine Zone is, as already stated in a previous article,[†] the Engelmann spruce, *Picea Engelmannii.* Often associated with it is found the subalpine fir, *Abies lasiocarpa.* Both extend throughout the Rockies from about latitude 55 degrees southward to the higher mountains of New Mexico and Arizona. They are also found in the northern portion of the western or Pacific province, i.e. throughout the Cascades, but not in the Sierra Nevada region. They are not found in the eastern province but are represented there by *Picea canadensis*, *P. mariana*, and *Abies balsamea.* Although the two species of *Picea* have been reported from Alberta and Montana, all specimens referred to these and seen by me have turned out to belong to *Picea albertiana*. *Picea Engelmannii* and *Abies lasiocarpa* may be regarded as endemic Rocky Mountain species, which have emigrated into the Cascades. In the Northern Rockies there could be added to these *Larix Lyallii*, which has also emigrated into the northern part of the Cascades. In the very lowest part of the Subalpine Zone there are sometimes found intermixed trees of *Pseudotsuga mucronata* belonging really to the Montane Zone. It has about the same distribution in the Rockies as the spruce and fir mentioned above, but is also equally common though in the Pacific province and extends south into the Sierra Madre of Mexico. It is hard to tell if its original home was in the Rockies or on the Pacific coast.

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[*] Also in Europe.

[†] See Bull. Torrey Club 42: 11. Ja 1915.

The two species, *Picea Engelmannii* and *Abies lasiocarpa*, are not restricted to the Subalpine Zone, however, for both run down into the Montane Zone on northern slopes and along streams. The element of the Rocky Mountain flora, which has the same distribution as these, is, as stated before, not large and it contains no other woody plants.

Trees

Picea Engelmannii
Abies lasiocarpa

Herbs

Trisetum majus
Poa reflexa
“ *leptocoma*
“ *Paddensis*
“ *nevadensis*
† “ *rupicola*
†*Festuca saximontana*
Carex Engelmannii
“ *pyrenaica**
“ *petasata*
“ *Geyeri*
Juncus balticus montanus
Ophrys nephrophylla
Trollius albiflorus
Cardamine acuminata
Arabis rupestris
“ *Drummondii*
Lithophragma bulbifera
Ozomelis stauropetala
Leptasea austromontana
†*Sieversia ciliata*
Epilobium Drummondii
†*Phlox caespitosa*
Macronema grindelifolium
Aster apricus
Anaphalis subalpina
Antennaria umbrinella
“ *anaphaloides*
Arnica Parryi
“ *Rydbergii*

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* Also in Europe and Asia.

2. Endemic species, common to the Northern and Southern Rockies

The endemic element, which extends over the whole Rockies, but has not invaded the Cascades, is much larger, but it does not include any of the forest trees and only a few shrubs. It consists of the following species:

Shrubs

†*Salix petrophila*
† “ *saximontana*
“ *brachycarpa*
Ribes parvulum
†*Vaccinium oreophilum*
“ *scoparium*

Herbs

Potamogeton interior
Stipa Tweedyi
“ *minor*
“ *Nelsonii*
Deschampsia curtifolia
Poa Olneyi
“ *Buckleyana*
“ *epilis*
“ *laevigata*
Bromus Porteri
“ *Pumpellianus*
Festuca ingrata
Agropyrum andinum
“ *Scribneri*
Carex pseudoscirpoidea
† “ *albonigra*
† “ *chalciolepis*
† “ *scopulorum*
† “ *chimaphila*
Allium brevistylum
*Disporum trachycarpum**
Ophrys borealis
Eriogonum flavum
Bistorta linearifolia
†*Claytonia megarrhiza*
†*Oreobroma pygmaea*
Alsine strictiflora‡
Cerastium scopulorum
“ *strictum*
†*Alsinopsis propinqua*
† “ *obtusiloba*
Silene Douglasii
“ *Menziesii*
†*Anemone zephyra*
Thalictrum venulosum
Atragene tenuiloba
†*Ranunculus affinis*
† “ *eximius*
“ *alpeophilus*
Aquilegia caerulea
Thlaspi glaucum
†*Smelowskia americana*
Radicula alpina
†*Draba andina*
“ *crassa*
†*Clementsia rhodantha*
Heuchera parviflora
†*Saxifraga debilis*

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* East to Manitoba and the Black Hills.

‡ East to Quebec.

†_Muscaria adscendens_*
“ _delicatula_
†_Micranthes rhomboidea_
“ _arnoglossa_
†_Spathularia Vreelandii_
Potentilla filipes
“ _glaucophylla_
“ _divisa_
† “ _saximontana_
“ _arachnoidea_
Fragaria glauca
†_Acomastylis turbinata_
Lupinus parviflorus
“ _caespitosus_
†_Trifolium nanum_
Atelephragma elegans
Aragallus deflexus
†_Epilobium clavatum_
“ _wyomingense_
Osmorrhiza obtusa
†_Vaccinium oreophilum_
“ _scoparium_
†_Primula Parryi_
†_Androsace carinata_
“ _subumbellata_
“ _filiformis_
Anthropogon elegans
†_Dasystephana Romanzovii_
† “ _affinis_
Pleurogyne fontana
Swertia scopulina
† “ _congesta_
Leptodactylon pungens
†_Phlox depressa_
Phlox Kelseyi
“ _alyssoides_
†_Phacelia sericea_
† “ _ciliosa_
†_Eritrichum elongatum_
_Myosotis alpestris_*
Besseya gymnocarpa
Castilleja rhexifolia
“ _lanata_
“ _lancifolia_
† “ _occidentalis_
Valeriana edulis
Solidago scopulorum
† “ _ciliosa_
“ _oreophila_
Chrysopsis pumila
†_Aster alpinus_*
“ _Fremontii_
†_Erigeron trifidus_
“ _glabellus_
“ _flagellaris_
Antennaria microphylla
“ _sedoides_
“ _aprica_
Chaenactis alpina
†_Rydbergia grandiflora_
Achillea subalpina
†_Artemisia scopulorum_
Arnica subplumosa
“ _rhizomata_
“ _pumila_
†_Senecio Purshianus_
“ _cymbalarioides_
“ _pseudaureus_

3. ENDEMIC SPECIES LIMITED TO THE NORTHERN ROCKIES

The following endemics are not merely local but are practically limited to the Northern Rockies:

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* Also in Europe.

Shrubs

†*Salix Tweedyi*
Salix Fernaldii

Herbs

*Alopecurus caespitosus**
Agrostis idahoensis
Poa nervosa
" *confusa*
Sitanion rigidum
Agropyron latiglume
Xerophyllum Douglasii
Erythronium obtusum
Eriogonum caespitosum
" *heracleoides*
Spraguea multiceps
†*Alsine americana*
Arenaria lithophila
†*Silene Lyallii*
" *multicaulis*
Anemone tetonensis
" *lithophila*
Ranunculus saxicola
" *Helleri*
†*Caltha leptosepala*
†*Aquilegia Jonesii*
†*Smelowskia lobata*
†*Draba densiflora*
Arabis oreophila
" *exilis*
Coniomitella Williamsii
Heuchera flabellifolia
" *grossularifolia*
†*Telesonix heucheriformis*
†*Muscaria monticola*
†*Micranthes Rydbergii*
" *occidentalis*
† " *saximontana*
Potentilla glomerata
" *perdissecta*
" *Macounii*
" *ovina*
†*Acomastylis sericea*
Lupinus pulcherrimus
" *monticola*
Trifolium Haydeni
† " *montanense*
Cystium platytropus‡
Atelophagma Forwoodii
" *debilis*
Homalobus Bourgovii
†*Aragallus foliolosus*
† " *alpicola*
† " *viscidus*
† " *viscidulus*
Viola flavovirens
Epilobium latiusculum
" *saximontanum*
Ligusticum filicinum
Pseudoreoxys bipinnata
Angelica Roseana
Bupleurum americanum
" *purpureum*
Vaccinium globularis
†*Douglasia montana*
†*Dasystephana monticola*
Polemonium pulcherrimum
† " *viscosum*
†*Collomia debilis*
†*Phlox costata*
† " *diapensioides*

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* Canadian Rockies only.
‡ Also in Nevada.

Phacelia alpina
† " *Lyallii*
Mertensia stenoloba
† " *Tweedyi*
Pentstemon Lyallii
† " *montanus*
" *aridus*
" *pseudohumilus*
" *Tweedyi*
Synthyris laciniata
" *dissecta*
†*Castilleja Tweedyi*
† " *pulchella*
†*Pedicularis ctenophora*
† " *cystopteridifolia*
Oreostemma Haydeni
†*Erigeron radicatus*
Hulsea carnosa
Senecio sphaerocephalus
† " *alpicola*
" *megacephalus*

Some of these endemics of the Northern Rockies extend south into the Wasatch Mountains of Utah. As I have already stated, the exchange of species between the Northern and Southern Rockies does not take place along the continental divide in Wyoming, but between the Wasatch and Teton Mountains, through the Bear River Mountains in southeastern Idaho. This exchange is more evident in the Montane Zone, but the following northern endemics have crossed the line and their range extends into Utah:

Eriogonum heracleoides
Arabis oreophila
Anemone tetonensis
Potentilla Macounii
Ligusticum filicinum
Angelica Roseana
Vaccinium globulare
Polemonium viscosum
Collomia debilis
Synthyris laciniata

A few of the northern endemics extend eastwards into the Black Hills of South Dakota such as:
Atelephragma Forwoodii
Epilobium saximontanum

4. ENDEMIC SPECIES RESTRICTED TO THE SOUTHERN ROCKIES

The endemics are more numerous in the Southern Rockies than in the Northern. The more widely distributed are the following:

Shrubs

Salix pseudolapponum
" *Wolfii*
Ribes coloradensis
Ribes Wolfii
Sambucus microbotrys

Herbs

Muhlenbergia Wolfii
" *subalpina*
" *filiculmis*
" *gracilis*
†*Deschampsia alpicola*
†*Avena Mortoniana*
Trisetum montanum
Graphephorum Wolfii
†*Poa alpicola*
" *Vaseyana*
" *occidentalis*
" *lucida*
" *aperta*
" *longipedunculata*
" *Sheldoni*
† " *Pattersoni*
" *Traceyi*
† " *Grayana*
† " *Lettermanii*
Festuca arizonica
" *Thurberi*
† " *minutiflora*
Elymus simplex
Carex elynoides
" *occidentalis*
" *Egglestonii*
" *eburnea*
" *Nelsonii*
† " *bella*
Veratrum tenuipetalum
Anticlea coloradensis
Juncus Hallii
" *parous*
Juncoides subapetalum
Erythronium parviflorum
Sisyrinchium alpestre
Limnorchis purpurascens
Eriogonum arcuatum
" *chloranthum*
" *neglectum*
†*Paronychia pulvinata*
Cerastium Earlei
" *variabile*
" *oreophilum*
Alsinopsis macrantha
Arenaria confusa
" *Tweedyi*
" *Fendleri*
Silene Hallii
†*Wahlbergella montana*
*Ranunculus alismaefolius**
" *Macauleyi*
" *micropetalus*
† " *adoneus*
† " *stenolobus*
†*Caltha rotundifolia*
†*Aquilegia saximontana*
" *elegantula*
" *oreophila*
Aconitum Bakeri
" *insigne*
Delphinium occidentale
" *Barbeyi*
†*Thlaspi coloradense*
† " *purpurascens*
†*Smelowskia leariloba*
Lesquerella parvula
" *montana*
Sophia purpurascens
Cheirinia oblanceolata
" *nivalis*
† " *radicata*
† " *amoena*
†*Draba Parryi*

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* North to Wyoming.

Draba chrysantha
“ *graminea*
“ *streptocarpa*
“ *spectabilis*
“ *luteola*
“ *aureformis*
†*Rhodiola polygama*
Ozomelis stenopetala
“ *Parryi*
Heuchera flavescens
†*Telesonix Jamesii*
†*Saxifraga simulata*
†*Micranthes brachypus*
†*Leptasea chrysantha*
Potentilla modesta
“ *viridior*
“ *decurrens*
Drymocallis fissa
†*Trifolium stenolobum*
† “ *lividum*
† “ *dasyphyllum*
“ *Brandegei*
† “ *Parryi*
Homalobus humilis
Aragallus oreophilus
“ *Parryi*
Lathyrus arizonicus
Geranium Pattersonii
Viola neomexicana
“ *bellidifolia*
Epilobium ovatifolium
“ *stramineum*
Ligusticum Porteri
Ligusticella Eastwoodiae
†*Oreoxis humilis*
† “ *Bakeri*
† “ *alpina*
Pseudocymopterus montanus
Pseudocymopterus sylvaticus
† “ *Tidestromii*
Pseudopteryxia anisata
“ *longiloba*
Oxypolis Fendleri
†*Angelica Grayi*
Conioselinum scopulorum
“ *coloradense*
†*Primula angustifolia*
Androsace pinetorum
†*Anthropogon barbellatum*
†*Amarella monantha*
†*Condrophora Fremontii*
† “ *americana*
Dasystephana Parryi
Ploemonium delicatum
“ *foliosissimum*
† “ *confertum*
“ *miletum*
† “ *Brandegei*
Gilia globularis
†*Phlox condensata*
Phacelia nervosa
†*Eritrichium argenteum*
Mertensia polyphylla
† “ *lateriflora*
† “ *Bakeri*
† “ *nivalis*
† “ *viridula*
† “ *Parryi*
† “ *alpina*
†*Pentstemon Hallii*
† “ *stenosepalus*
† “ *Harbourii*
† “ *caespitosus*
Chionophila Jamesii
†*Besseya alpina*
“ *plantaginea*

Besseya Ritteriana
Castilleja brunnescens
“ *confusa*
† “ *puberula*
†*Pedicularis Parryi*
“ *Grayi*
† “ *scopulorum*
Valeriana acutiloba
Campanula Parryi
Coleosanthus umbellatus
Solidago decumbens
†*Tonestus pygmaeus*
Oreochrysum Parryi
Chrysopsis alpicola
“ *asprella*
Pyrrocoma Clementis
Townsendia grandiflora
Aster Canbyi
†*Erigeron pinnatisectus*
† “ *melanocephalus*
† “ *leiomeris*
“ *glandulosus*
“ *elatior*
“ *superbus*
“ *formosissimum*
Hymenopappus cinereus
†*Rydbergia Brandegei*
†*Artemisia Pattersonii*
†*Artemisia saxicola*
Arnica macilenta
“ *ovata*
Senecio chloranthus
“ *pudicus*
† “ *amplectens*
“ *pagosanus*
† “ *Holmii*
† “ *taraxacoides*
“ *Soldanella*
“ *carthamoides*
“ *invenustus*
“ *admirabilis*
“ *lapathifolium*
“ *crassulus*
“ *perplexans*
“ *anacletus*
“ *atratus*
“ *foliosus*
† “ *Harbourii*
“ *Nelsonii*
“ *crocatus*
“ *Jonesii*
† “ *petrocallis*
“ *pentadontus*
† “ *werneriaefolius*
“ *ambrosioides*
“ *multicapitatus*

5. LOCAL ENDEMIC SPECIES

The following are rare and local species which have been collected at only one or two localities within the Canadian Rockies or the states mentioned below:

Canadian Rockies

†*Wahlbergella attenuata*
†*Cassiope saximontana*
†*Douglasia nivalis*
†*Mertensia Drummondii*
†*Antennaria chlorantha*
“ *acuta*

Montana

†*Potentilla Vreelandii*
Dodecatheon uniflorum
Pedicularis Canbyi

Idaho

Allium simillisimum
Romanzoffia Leibergii
†*Tonestus laceratus*

Wyoming

†*Oreobroma minima*
Aconitum ramosum
†*Draba ventrosa*
†*Muscaria micropetala*
Potentilla wyomingensis
" *virgultata*
" *Nelsonii*
†*Pedicularis Hallii*
" *lunata*
†*Trifolium scariosum*
Mertensia viridis
Aquilegia larimiensis
†*Erigeron flabellifolius*
Arnica tenuis

Utah

†*Wahlbergella Kingii*
Aquilegia scopulorum
Delphinium attenuatum
Capnorchis brachycarpum
Lesquerella Wardii
†*Draba sobolifera*
" *brachystylis*
Gormannia debilis
Edwinia macrocalyx
Potentilla paucijuga
†*Synthyris pinnatifida*
Castilleja viscida
" *parvula*

Colorado

Poa callicroa
" *pudica*
" *tricholepis*
Allium Pikeanum
Alsine polygonoides
Radicula curvipes
Radicula Underwoodii
Arabis oblanceolata
†*Potentilla tenerrima*
† " *minutifolia*
†*Trifolium bracteolatum*
†*Trifolium attenuatum*
†*Aragallus Hallii*
†*Polemonium Grayanum*
Besseya reflexa
Chaenactis peduncularia

One of the strangest distributions is that of *Viola biflora*, a European species, which has been collected in America only at a few places in Colorado and in Alaska.

Summary

The subalpine flora contains over eight hundred species. Of these about 30 per cent. are also found above the timberline and about 60 per cent. are also found in the Montane Zone or pine belt. This leaves only about 10 per cent., which are restricted to the Subalpine Zone. The percentage of characteristic subalpine species is, however, larger, probably 25 per cent. or 30 per cent. of the number, for the 30 per cent. growing above the timberline is divided into two categories, alpine plants descending below the timberline, and subalpine species ascending above the same. So are also some of the plants which are common to the Subalpine and Montane Zones, essentially subalpine, though they descend into the upper part of the Montane Zone. A small proportion is even common to the three zones, and a few, as for instance *Poa crocata*, range from the plains to the alpine regions.

Of the eight hundred species, over 20 per cent. are transcontinental plants, and of these the larger part, about 15 per cent. of the whole number, extend as far south as Colorado and scarcely 2 per cent. are confined to the Canadian Rockies. About one hundred species are common to the old world. Besides the transcontinental element nearly 20 per cent. more are common to some part of the Rocky Mountain region and some part of the Pacific mountains. Of these about 5 per cent. are equally distributed throughout both provinces and 6 per cent. limited to the northern part of both. The remainder is about equally divided between Rocky Mountain plants which have invaded the Cascades and Pacific plants found in the Northern Rockies.

The strictly endemic species constitute nearly 60 per cent., and if those which have invaded the Pacific mountains are added the endemic element comprises about 70 per cent. of the flora. Of the 60 per cent. of strictly endemic plants fully one half are restricted to the Southern Rockies, fully one fourth common to both, and less than one fourth restricted to the Northern.

Of the trees and shrubs found in the Subalpine Zone, eighteen are transcontinental, eighteen are common to the Pacific mountains or emigrants from them, nine are immigrants into the Canadian Rockies from arctic regions, and eighteen are endemics, five of which have invaded the Cascades. Of the endemics, eight are common to both the northern and the southern Rockies, and five are limited to each region; none of them are strictly local.

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